

Risk Determinants of Islamic Banking in the Mena Countries during the Global Financial Crisis and the Arab Spring Period: A Search for Empirical Evidences

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Abstract

The aim of the study is to identify both macroeconomic and bank specific determinants of risks in Islamic banks. We also try to identify evidence on the impact of financial crisis and political instability during the Arab spring period. The study covers a sample of 34 Islamic banks across 13 countries during the period 2000-2013.

We use different proxies of risk as dependent variable: insolvency risk (measured by Z score) and credit risk (measured by loans to deposits) and estimate four regressions using the dynamic Generalized Method of Moments (GMM).

Our results reveal that bank size, capital adequacy, liquidity, diversification and specialization ratios are the major factors affecting the stability of Islamic banks. For macroeconomic factors, GDP and inflation affect credit risk and insolvency of Islamic banks respectively. Finally, we find that financial crisis does not affect Islamic bank risk, while Arab spring has significant influence on credit risk.

In general, the findings are important for the identification of the factors influencing Islamic bank risk then for providing information that the bank management and regulators should pay attention to, in order to improve risk management in Islamic banking.

Keywords: Specific bank and Macroeconomic determinants; Credit risk; Z-score; Islamic banking; GMM method, Regulation, Financial crisis, Arab spring, Mena region

JEL Classification: G21; G32

1. Introduction

The emergence of the global financial crisis and the economic recession lead to the deterioration of the solvency of many financial institutions and particularly the collapse of many banks. In light of these events, Islamic finance is considered as an alternative to the traditional financial system.

The essential role of both conventional and Islamic banks is to manage the different types of risks. Islamic banks are governed by sharia rules and principles that lead to significant differences with conventional banks operations. Ben Khediri et al. (2015) identify 5 differences between conventional banks and Islamic banks: **(1)** The principle of sharing profits and losses is one of the most important features of Islamic finance. Olson and Zoubi (2016) explain that on the asset side, instead of conventional loans, Islamic banks exchange contracts based on (Murabaha), lease-based contracts (Ijara and Istisna), and profit-sharing contracts (Mudarabah and Musharka). If a financial institution expose itself to such a collapse or bankruptcy, the losses would be limited to investors and depositors of the same bank without affecting the depositors of other institutions. **(2)** The principle that all transactions must be safeguarded by a real economic transaction involving a tangible asset. Credit is based on real savings and it can only produce a return if it is directly invested in productive activities. **(3)** The prohibition of the RIBA (excessive Interest) **(4)** The Prohibition of Gharar (excessive uncertainty) and maysar (excessive risk or gambling). **(5)** Restrictions on the use of funds. In fact, Islamic banks are limited in the types of investments they can offer to customers.

Islamic banks and conventional banks can be also differentiated in terms of risk (Metwally, 1997). According to the IMF (2017), risk management in Islamic banks emphasizes risk-sharing (while in conventional banking, it emphasizes risk transfer), which significantly restricts the use of conventional hedging mechanisms. Indeed, some risks are shared by both conventional and Islamic banks. However, Islamic banks face a series of risks specific to their nature. The most significant risks facing the Islamic bank are of three types: credit risk, liquidity risk and operational risk (Hussain & Al-Ajmi, 2012). For Islamic financial techniques, credit risk is very real and very present (Khan & Ahmed, 2001; Haron & Hin Hock, 2007; Sundararajan, 2007). Indeed, Mourabahah, Istisna, Ijarah and Salam are all futures contracts that create a debt for Islamic banks that bear the risk when customers cannot repay their debts. Participation and investment contracts may be also at risk, although the advance of capital is done on a basis of participation in the profits and losses and not on a credit basis. Risks in this group of contracts arise when one partner is the cause of damage or negligence of assets it manages. On the other hand, an entrepreneur-partner can refuse to share the profits, which can also be part of the credit risk. Chapra and Khan (2000) indicate that the major factors that increase the credit risk of Islamic banking institutions are the prohibition of interest, which does not allow Islamic banks to reschedule debts based on a renegotiated margin providing their customers unscrupulous encouragement to be faulty; and also the unavailability of the instruments of risk coverage based on the interest rate, as it is forbidden by the Sariah committees.

Nevertheless, the Islamic financing system kept its stability during the subprime crisis contrary to the traditional financial system (Ftiti et al., 2013; Mat Rahim & Zakaria, 2013). Some studies support the hypothesis that Islamic banking has a lower credit risk than conventional banking which may be due to contractual arrangements (Baele et al., 2012). Indeed, profit loss sharing (PLS) mechanisms allow Islamic banks to keep their net worth and avoid the deterioration of their balance sheets in difficult economic situations. Since both the principal and the return of deposits are guaranteed, any loss that occurs on the asset might be totally absorbed on the liabilities side. The default risk can also be removed by PLS principle. This suggests that Islamic banks can have a greater ability to withstand losses compared to conventional banks (Abedifar et al., 2016). Other types of Islamic financial modes based on the mark-up (eg Murabaha, Ijaras and Istisnaa) require investors to engage in the real economy and therefore a real advantage lies in the financial transaction. This feature allows Islamic banks to have a clearer vision on the allocation of funds and reduce their exposure to speculative behavior. Moreover, Islamic banks can have a lower credit risk because of the religiosity of clients that improves loyalty and default mitigates and / or because of their special relationship with their depositors (Abedifar et al., 2016). Siddiqui (2008) explains that the credit risk reduction by the fact that these Islamic contracts are based on the equity that minimizes adverse selection and moral hazard problems. Indeed, Islamic finance requires symmetry of information and transparency of transactions since Islam prohibits excessive uncertainty (gharar). In addition, the (maysir) is prohibited, which means that excessive risk taking is not allowed. The tangibility of assets reduces the problem of substitute assets by engaging in other activities with a higher risk. Adherence to these principles should reduce the risk.

Despite the differences existing between Islamic and conventional finance, no specific treatment is given to Islamic financial institutions. The example of the financial authorities in the United Kingdom can be reported at this level. In fact, the Financial Services Authority (FSA) uses the principle of "no special treatment: No obstacle no favor" while acknowledging the specificity of Islamic finance. Hence, Islamic finance has intensified its standardization, regulatory and control efforts through the establishment of organizations that ensure the compliance of Islamic financial institutions with Sharia law and their integration into Global finance. By then, the Islamic banking industry has grown rapidly since the early 2000s¹. Total assets in the Islamic banking industry grew from \$195 billion in 2000 to \$1451 billion in 2015 and this is expected to further increase to \$2716 billion by 2021 (Safiullah & Shamsuddi, 2018). In addition, Islamic financial activity has spread to Western countries mainly in the United Kingdom, the United States and Germany. In the Arab countries, changes took place after the "Arab Spring" crisis, urging governments to reflect on new economic opportunities (Safiullah & Shamsuddi, 2018).

Early studies on credit risk determinants had primarily focused on conventional banking credit risk management particularly, in developed countries (Berger & DeYoung, 1997; Berger & Udell, 1990, 1994). A few other relevant studies have attempted to address Islamic banks' risk management. For example, Febianto (2012) conducted a library-based research analysis, and Abedifar et al. (2013) did an empirical analysis on 24 Organization of Islamic Cooperation (OIC) countries. Most studies suggest that there are two strands of literature on the factors that drive credit risk. The most popular strand suggests that credit risk is driven by several bank specific variables (internal variables) and the second strand argues that macroeconomic factors greatly influence the credit risk of banks (external variables). A survey of the literature informs us that either previous studies normally examined the determinants of credit risk using internal or external factors as explanatory variables. However, a few studies used both kind of variables to explain Islamic banks risks (Trad et al, 2016; Safiullah & Shamsuddi, 2018). In addition, existing studies provide a record of the effect of internal and external variables on the banks risk in a country (Ahmad & Ahmad, 2004).

Our study differs from previous contributions in that we test the hypothesis of determinants of Islamic bank risk on a panel of countries in the MENA region. The MENA region's choice is justified by the importance of the banking sector as the main source of financing for the economy in general and for investment in particular. According to the Bank Negara of Malaysia, in the end of 2014, this region accounts for 45% of total Islamic banking assets worldwide². In addition, all major Islamic banks are grouped in this part of the world as the IDB (in Jeddah). It also has the largest Islamic financial market in the world and the largest Islamic investment funds. We adopted several ratios from the empirical literature on Islamic bank risk using a dataset of 34 countries during the period 2000-2013 and performing the GMM method. In particular, we add the variable reflecting the country's regulatory framework and the quality of the institutions (as institutional indicators) to see their impacts on the risk of Islamic banks.

Several studies have explored the impact of the global financial crisis on conventional bank risk, either at the country level or even at the cross country level (Dridi & Hasan, 2010; Trad et al., 2017). However, an area that has not been adequately explored has been the impact of political instability and particular the Arab Spring on Islamic banking system. Our contribution is to identify the effect of both micro and macro variables of the risk of Islamic banks. We also try to study the role of both financial crisis and the Arab spring on the financial stability of Islamic banks in the Mena region. In fact, in our knowledge, there is no study that explores both the financial crisis and the political instability during the Arab spring period in the Mena region.

Our results reveal that bank size, capital adequacy, liquidity, diversification and specialization ratios are the major bank-level indicators of the stability of Islamic banks, whereas GDP and inflation

¹ See Figure 1 in the Appendix.

² See Figure 2 in the Appendix.

increase the credit risk. Finally, we find that financial crisis does not affect Islamic bank risk while Arab spring has significant influence on credit risk.

The rest of the paper is structured as follows. *Section 2* contains a review of the related literature. *Section 3* describes the data and methodology. *Section 4* reports and discusses the results and their analysis. *Section 5* concludes the paper with a summary of the main results and the policy implications.

2. Literature Review

Credit Risk in Islamic Banking

Safiullah and Shamsuddi (2018) indicate that credit risk refers to the possibility that the borrower will not pay a loan in accordance with the stipulated contract. Unlike conventional banks, the different modes of financing in Islamic banks can give rise to a different credit risk profile. Hussain and Al-Ajmi (2012) report that credit risk is the most important risk in Islamic banks and it needs a comprehensive technique in the banking system. Moreover, Islamic banks may face higher credit risk in PLS modes of financing because of the moral incentives of borrowers associated with the possibility of sharing losses with banks. Religious restriction on the use of conventional credit risk mitigation tools such as credit derivatives is also likely to increase the exposure to credit risk of Islamic banks (Errico & Farahbaksh, 1998). However, the type of partnership contract between borrowers and banks can reduce information asymmetry, improves the adverse selection problem, and makes it easier to understand the creditworthiness of borrowers which reduces credit risk. Also, Islamic banks may have lower exposure to credit risk due to borrowers' religious beliefs about the Islamic banking system, fairness and discouragement (Abedifar et al., 2013; Baele et al., 2014).

Insolvency Risk in Islamic Banking

According to Safiullah and Shamsuddi (2018), a bank is considered insolvent if the value of its assets falls below the value of its liabilities. In the case of Islamic banks, the principle of profit and loss sharing reduces the volatility of cash flows and increases banks' ability to absorb losses and thus weaken the risk of insolvency. However, Sharia's constraints on portfolio diversification, prohibition of interest and the use of conventional risk hedging instruments may make Islamic banks riskier and therefore less financially stable (Beck et al., 2013; Sensoy, 2016). Also, the reliance of Islamic banks on stock-based contracts does not give the debt market an opportunity to monitor their risk profile. This can compromise financial stability by reducing incentives for risk management.

A review of the literature (see Table 1) informs us that previous studies normally examined risk determinants using Bank Specific variables (BSV) or macroeconomic factors as explanatory variables. However, recent studies incorporate both BSV and macroeconomic variables to explain credit risk as well as the insolvency risk. Table 1 shows that credit risk and insolvency risk management studies have attracted the attention of many parties in different countries. The study of credit risk and insolvency risk determinants in the banking sector is not only important for bank management but also for regulators. This will help them understand and propose a comprehensive risk management framework (Misman et al., 2015).

Table 1: Existing literature of the relationship between Credit risk, insolvency risk and their factors in Islamic banks

Authors	Objective	Methodology	Main findings
Ahmad & Ahmad (2004)	To identify the credit risk determinants of Islamic	A full Islamic bank, 6 Islamic wickets and 6 conventional banks for the period 1996-2002. NPL to total loans (credit risk) Predictors consist of seven variables:	Management efficiency, asset quality and bank size have a significant effect on credit risk of Islamic banks, while credit risk of conventional banks is affected by exposure to loans, loan loss provision, regulatory

Authors	Objective	Methodology	Main findings
	banking operations in Malaysia.	management efficiency, leverage, risky sector loan exposure, regulatory capital, loan loss provision, funding cost, Risk-weighted assets, natural log of total assets and proportion of loan to deposit.	capital and quality of assets. Leverage, credit-weighted financing cost and funding cost affect credit risk in both types of banks.
How et al. (2004)	To examine whether Islamic financing can explain credit risk, interest-rate risk, and liquidity risk in a country with a dual banking system	23 commercial banks in Malaysia from 1988 to 1996. Parametric t- and nonparametric Mann-Whitney tests Credit risk (ratio of allowance for loan losses to total assets) Liquidity risk (ratio of liquid assets to total liabilities) Interest rate risk Bank specific variables (derivative contracts to total assets, documentary credits to total assets, loan sales, loan volatility; capital adequacy).	Commercial banks have lower credit and liquidity risks but significantly higher interest-rate risk than banks that do not offer such facilities. Bank size is a significant determinant of credit risk; the proportion of loan sales to total liabilities and bank size can explain differences in interest-rate risk across banks; off-balance-sheet financing, the extent of securitization, loan volatility, bank capital, and bank size are the determinants of liquidity risk.
Čihák & Hesse (2010)	To examine and to compare the insolvency risk of Islamic and conventional banks	776 Islamic banks and 397 commercial banks From 1993 to 2004. Z-Score Individual bank level (size, asset composition, and cost efficiency) Macroeconomic variables (GDP growth rate, inflation rate, and exchange rate depreciation). Governance indicator (voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption).	Small Islamic banks are financially stronger than small commercial banks; large commercial banks are financially stronger than large Islamic banks; small Islamic banks are financially stronger than large Islamic banks. Large (small) Islamic banks are less (more) stable than large (small) commercial banks; Banks that grant more credits and do not control the cost / income ratio have lower z scores; Z-scores tend to increase with bank size for large banks but decrease with size for smaller banks. Greater income diversity and better governance tends to increase z scores in major Islamic banks; Real GDP growth and inflation do not appear to have significant effects on Z-score of Islamic banks.
Baele et al. (2012)	To compare credit risk on conventional and Islamic banks	Pakistan 2006:04 – 2008:12 Hazard function Monthly business loans Credit risk (Loan default rate)	Default rates on Islamic loans are lower than for conventional loans.
Abedifar, et al. (2013)	To determine risk and stability features of Islamic banking	553 banks from 24 countries between 1999 and 2009 Random effects Credit risk, insolvency risk, interest rate risk,	Credit risk is low in small, leveraged or Islamic banks in predominantly Muslim countries. Small Islamic banks are more stable than small conventional banks. In times of crisis, large Islamic banks have a lower stability than large conventional banks. Credit risk of Islamic banks is less sensitive to domestic interest rates.
Srairi (2013)	To study the impact of ownership structure, country and bank specific characteristics and the regulatory framework	10 countries in MENA region (131 banks); from 2005 to 2009. Panel data analysis and 2SLS Credit risk (non-performing loans to total loans) Insolvency risk (z-score) Ownership concentration; the nature of the owners (Family, Company, and State). Credit risk model: bank size, efficiency, profitability, operating leverage, loan	A negative association between ownership concentration and risk. Family-owned banks have incentives to take less risk. State-owned banks display higher risk and have significantly greater proportions of non-performing loans than other banks. Private Islamic banks are as stable as private conventional banks. However, Islamic banks have a lower exposure to

Authors	Objective	Methodology	Main findings
	on banking risk.	growth and leverage. Insolvency risk model: size, efficiency, profitability, operating leverage, asset growth and Diversification. Country-level control: economic development (GDP), inflation, banking sector development, competition in the banking system, deposit insurance and shareholders' rights and interest rate.	credit risk than conventional banks. Size affects significantly bank risk. Insolvency risk in countries with two financial systems (conventional and Islamic) depends on the country's financial and economic environment, the level of market share of Islamic banks, the legal and regulatory framework and the level of use of PLS methods by Islamic banks.
Shahid & Abbas (2012)	To compare insolvency risk in Islamic banks and conventional banks in Pakistan.	6 Islamic banks operating in Pakistan and top 10 conventional banks ranked by credit rating agencies. from 2006 to 2009. Industry specific variables (Herfindahl-Hirschman index), Bank specific variables (bank size, loan to asset ratio, cost to income ratio and income diversity), Macroeconomic variables (GDP growth rate, inflation rate and exchange rate depreciation) Country specific variables (accountability, political stability, government effectiveness, regulatory quality, rule of law and control of corruption).	Islamic banks are stronger than conventional banks regardless of bank size. Nevertheless, conventional banks are more efficient. Islamic banks give less credit and show the trend of low risk investments, but their income is less diversified than conventional banks. DGP growth and exchange rate depreciation positively affect Z-Score. Islamic banks are relatively less (more) likely to default when they operate on a small (large) scale.
Rajhi & Hassairi (2013)	To investigate whether Islamic banks are more stable than conventional banks.	Banks in 16 countries (6 Southeast Asian countries and 10 MENA countries) where Islamic and conventional banks coexist over the period 2000-2008. Insolvency risk: Z-Score bank specific variables (bank size, capital adequacy, credit risk, cost-income ratio and liquidity risk). macroeconomic variables (GDP Growth; inflation; Official Exchange Rate).	Islamic banks' z-scores are higher than those of conventional banks (indicating higher stability than conventional banks), except for small Islamic banks. Credit risk and income diversity are the cause of insolvency for Islamic banks. Credit risk measured by the ratio of loan loss provisions to net interest income decreases the z-score in small Islamic banks in MENA countries and large Islamic banks in Southeast Asian countries. Income diversification is a cause of insolvency for small and large Islamic banks in Southeast Asian countries.
Waemustafa & Sukri (2015)	To identify bank specific and macroeconomic determinants of credit risk in Islamic and Conventional Bank	15 conventional banks and 13 Islamic Banks in Malaysia over the period 2000-2010. 16 bank specific variables and 6 macroeconomic variables. credit risk (nonperforming loans to total loans and nonperforming finance to total finance).	No difference in term of solvency, leverage, management efficiency and profitability between Islamic banks and conventional banks. Risky financial sector; regulatory capital and Islamic Contract are significant to credit risk of Islamic banks. For Conventional Banks, debt-to-total asset ratio, loan loss provision, size capital, liquidity and earning management are the credit risk determinants. Macroeconomic factors: Inflation and M3 affect credit risk for both Islamic and Conventional banks

Authors	Objective	Methodology	Main findings
Kabir, et al. (2015)	To compare credit risk in Islamic and conventional banks	156 conventional banks and 37 Islamic banks in 13 countries between 2000 and 2012 Aforementioned techniques, group mean comparison test. Market-based credit risk measure, Merton's distance-to-default (DD) model; Z-score and non-performing loan (NPL). Bank specific variables (size; cost inefficiency; Loan to assets ratio; ROA) Macroeconomic variables (GDP, inflation, governance and concentration).	Based on the Merton's distance-to-default (DD model), Islamic banks have lower credit risk than their counterparts. Conversely, Islamic banks have significantly lower Z-scores and higher NPLs than conventional banks, suggesting Islamic banks have higher credit risk. The chosen measure plays an important role in assessing the actual credit risk of Islamic banks. No difference in credit risk between the two banking systems during the most recent financial crisis. A positive relationship with both ROA, DD and Z-score and a negative relationship with both DP and NPL. Income diversification and GDP growth negatively affect credit risk. Inflation negatively affects DD and Z-score and positively affects DP and NPL.
Misman et al. (2015)	To identify credit risk determinants in Malaysian Islamic banks	1995 to 2013, Fixed effect model Ratio of NPF to total financing (credit risk) 7 Bank specific variables (financing expansion, financing quality, capital buffer, capital ratio, NIM; management efficiency and bank size).	Financing quality and capital adequacy demonstrate consistent results regardless of the models and estimation methods. Any deterioration in financing quality results in an increase in provisions for losses and an increase in the implicit credit risk. Capital adequacy negatively affects credit risk.
Haryono et al. (2016)	To identify the credit risk determinants in the case of Indonesian Islamic banks	11 full-fledged Islamic banks and 22 Islamic business units (windows) in conventional banks from 2004-2012. Dynamic panel data methods (GMM). Credit risk (non-performing financing). Macroeconomic variables (GDP growth, unemployment rate and inflation rate) and bank-specific variables (capital adequacy ratio; bank size; ROA; diversification opportunities; efficiency; ownership concentration; financing structure).	Macroeconomic variables: GDP growth rate and unemployment rate positively affect the level of nonperforming financing. Bank-specific variables: Bank diversification and financing structure positively affect financing level, although its direction is not that expected by the theory.
Trad et al. (2017)	To check if Islamic finance guarantees stability in crisis period and if it could be an alternative to traditional finance	78 Islamic banks in 12 countries over the 2004–2013 period. GMM System Bank-specific variables (bank size, capitalization, liquidity, asset quality) and country specific indicators (real gross domestic product, inflation rate and official exchange rates) are combined to explain Islamic banking soundness in terms of profitability (ROA and ROE), credit risk (Equity/Net loans and impaired loans/Gross loans) and insolvency risk (Z-Score).	Capital adequacy and bank size are the main factors that positively affect profitability and negatively credit risk and insolvency risk. Macroeconomic variables, except inflation, can reduce Islamic banks' insolvency. This is not the case for credit risk where the ratio is still unfavorable.
Miah & Uddin (2017)	To compare Islamic and conventional banks in terms of business orientation, stability, and efficiency.	48 conventional banks and 28 Islamic banks of the Gulf Cooperative Council from 2005 to 2014. Accounting ratios, Stochastic Frontier Analysis (SFA), and ordinary least square (OLS) regression techniques. Two proxies of banks' solvency: ratio of liquid asset to deposit and short-term funding and z-score.	Conventional banks are more efficient in managing cost than their Islamic counterparts. However, Islamic banks are more solid in terms of short-term solvency, but no such difference exists as far as the long-term stability is concerned. Larger banks have less intermediation ratio which indicates diseconomies of scale. Highly capitalized banks are more stable

Authors	Objective	Methodology	Main findings
		Bank characteristics: bank's size, earning assets, and equity buffer.	but cost inefficient which proves that capital-rich banks have failed to capitalize on the leverage effect.
Bitar et al. (2017)	To examine the impact of political systems on financial soundness of conventional and Islamic banks	729 banks (including 139 Islamic banks) in 33 developing countries for the period between 1999 and 2013. Three-stage approach (PCA on twenty-nine measures of bank financial soundness; Random-effect GLS regressions and Propensity score matching) Bank specific variables: Capital adequacy, asset quality, managerial qualities, profitability and earnings, liquidity Political index (difference between democracy and autocracy score Political environment (degree of institutional constraints, index of the world bank's database of political institutions Macroeconomic variables (inflation rate, GDP growth)	Capital adequacy, volatility of returns, efficiency, liquidity, the charging of rents for offering Sharia 'compliant' products, profitability and credit risk are the indicators of Islamic banks' financial soundness. Islamic banks underperform conventional banks in Western democratic nations but outperform them in countries that employ Sharia' a or hybrid legal systems Islamic banks are more capitalized, more efficient and profitable and have less credit risk The Arab Spring affects the profitability and increases volatility of earnings for Islamic banks.
Safiullah & Shamsuddin (2018)	To detect the differences in risk between Islamic and conventional banks with more attention to the impact of Shariah supervisory board composition on risk in Islamic banks.	188 banks from 28 countries for the period 2003–2014 GMM System Liquidity risk (loan-to-deposit ratio), credit risk (loan-loss reserves to gross loans and non-performing loans to gross loans), operational risk (asset return volatility) and insolvency risk (Z-Score). SSB size, SSB members' academic qualifications; SSB members' reputation A board governance index Bank-specific variables (capital-to-asset ratio, total assets growth, cost-to-income ratio, income diversity and bank size). Country-level control variables (bank concentration ratio, national governance and annual growth rate of per capita GDP).	Islamic banks face higher liquidity risk, lower credit risk and lower insolvency risk. Lower insolvency risk exposure of Islamic banks in predominantly Muslim countries. Islamic banks are resilient to the GFC. Parameters of Islamic banks' risk model statistically differ from those of conventional banks with respect to liquidity risk, credit risk and market-based measures of operational and insolvency risks. An increase in SSB size and the proportion of SSB members with higher academic qualifications decrease Islamic banks' insolvency risk and operational risk, Insolvency risk becomes greater when the proportion of SSB members with reputation is higher. The SSB attributes do not influence liquidity and credit risks.

3. Variables Definitions

3.1. Risk Measures

- **Credit risk:** We measured credit risk (CR) by the Loan to Deposit ratio. It should be noted that Islamic banks are prohibited from granting loans and receiving interest, but instead are allowed to use their deposits by providing financing through various Sharia-compliant financial products. Credit risk is even lower when the loan to deposit ratio is low. On the contrary, a bank with a high loan to deposit ratio shows that the bank is plunged into additional financial stress by making excessive financing. Thus, the higher the loan-to-deposit ratio, the more banks may be vulnerable to a financing shock and thus to an increased insolvency risk (Odeduntan et al., Hamisu, 2016).
- **Insolvency risk:** We use Z-score as a measure of insolvency risk. Z-score has become a popular measure of bank soundness (Čihák & Hesse, 2010; Abedifar et al., Tarazi, 2013; Shahid & Abbas, 2012; Trad et al., 2017 and Safiullah & Shamsuddin, 2018). It should be noted that Z-score is a reverse proxy for bank insolvency risk. Indeed, it indicates the number of standard deviations a

bank's ROA must fall below its expected value before exhausting its own funds and the bank becomes insolvent. Then, an important Z-score indicates that a bank is more solvent.

3.2. Risk Determinants

Based on a survey of related literature on risk determinants, several variables have been identified to form our regression model. In this study, we use bank specific variables such as size, asset quality, capital adequacy, liquidity ratios ... etc. In addition to bank-by-bank data, we incorporate country-specific variables, using a number of variables that take the same value for all banks in a given year and country. We follow Schaeck and Čihák (2010) using the inflation rate and the growth of the real gross domestic product. In addition, we introduce variables reflecting the regulations in force as well as two variables that take into account periods of crisis.

3.2.1. Bank Specific Indicators

- **Size:** Bank size can have an impact on risk. Indeed, banks with higher assets can benefit from economies of scale. In addition, large banks can benefit from their market power and can take advantage of accumulated abnormal profits. Nevertheless, large banks with larger transactions are sometimes pushed to bear a higher risk in order to generate higher margins (Maudos & Solís, 2009).
- **Liquidity:** The higher the liquidity, the lower the exposure to credit risk. Islamic banks do not have enough investment opportunities since they can only intervene in projects that conform to Shariah. Moreover, they cannot easily attract a large number of customers according to the principle of benefit sharing Hasan and Dridi (2010). In addition, they have limited access to the interbank market as well as to central banks, which calls into question the management of liquidity. However, previous empirical studies have shown that Islamic banks maintain higher liquidity ratios than conventional banks (Metwally, 1997, Olson & Zoubi, 2008, Boukhris & Nabi, 2013).
- Besides, a high liquidity ratio allows banks to cover its obligations in the short term and therefore it is financially stable. On the other hand, the lack of liquidity can lead to significant losses in portfolios of assets and liabilities and lead to financial difficulties and therefore insolvency.
- **Capital adequacy:** Bank capital can affect bank risk. This variable has been used almost in all previous studies dealing with risk determinants as shown in Table 1. The Central bank of Malaysia (BNM) has developed a Capital Adequacy Framework for Islamic Banks (CAFIB) to protect risk management practices and promote the stability of financial system by controlling the activities of banks at excessive risk. The cost of financing is low at well-capitalized banks and therefore they have a low risk of insolvency. Nevertheless, empirically, previous studies provide mixed results regarding the relationship between capital adequacy and credit risk (Misman et al., 2015).
- **Assets quality:** It can be approximated by the ratio loan loss provisions to total assets. This variable was used by Abedifar et al. (2013); Ahmad and Ahmad (2004) and Safiullah and Shamsuddi (2018), who suggest that this ratio indicates the amount of reserves to be allowed for credit losses. A greater loan loss provision is required if a bank is expected to be higher. Abedifar et al. (2013) add that a higher ratio would increase the bank insolvency risk. However, this may be ambiguous too as higher loan loss provisions could reflect banks' precautionary reserve building as well as high non-performing loans.
- **Management efficiency:** This variable shows how well banks manage their total costs relative to their revenues. In previous studies, management efficiency is usually measured by the ratio of costs to revenues (Ahmad & Ahmas, 2004, Čihák & Hesse, 2010; Srairi, 2013; Misman et al, 2015). This ratio indicates the speed with which expenses increase or decrease when income changes occur. Higher values indicate more inefficiency. It indicates the costs of running banks and is expected to affect credit risk and insolvency risk (Kabir et al., 2015).

- **Specialization:** this variable is estimated by the weight of deposits in total assets. The higher level of deposits indicates that banks have more traditional activities. Abedifar et al. (2013) suggest that, given the positive relationship between religiosity and an individual's risk aversion, Islamic banks may face less credit risk. In addition, greater discipline associated with greater deposit fragility (exerted by depositors' risk aversion) and the religious beliefs of borrowers can induce loyalty and discourage default. In terms of insolvency risk, the special relationship with depositors could provide Islamic banks with greater capacity to withstand losses, but operational limitations on investments and risk management activities could make them less stable.
- **Diversification:** This notion was determined by Laeven and Levine (2007). In Islamic banks, net interest income represents the difference between positive and negative income associated with profit and loss sharing (PLS) agreements and indicates the reduced reliance of banks on traditional lending activities. A higher level of commissions and fees reflects the bank's ability to diversify its products and services and to change the banks' revenue structure. According to Kabir et al. (2015), diversification helps banks collect more information on different products or industries, which reduces credit risk and insolvency. However, banks that focus more on non-traditional activities have higher risk due to lack of experience in non-core activities (Čihák & Hesse, 2010; Rajhi & Hassairi, 2014).

3.2.2. Macroeconomic Indicators

- **GDP growth rate (GGDP):** The growth of GDP could be a determining factor of the risk of banks probably due to the increase in debt rates. With the use of this variable, we can identify the effect of macroeconomic condition on Z-score (Rajhi & Hsairi, 2013). GDP per capita are associated with lower bank stability (Abedifar et al., 2012). In this study, we use real GDP growth rate where we expect higher growth to reflect better conditions for financial stability.
- **Inflation:** The inclusion of the inflation rate in our analysis allows us to see whether monetary policy affects the risk of banks. Inflation can affect both the costs and incomes of any organization, including banks. According to Bourke (1989), if the hypothesis of faster growth in wages and other non-interest costs relative to inflation is observed, the consumer price index could be used as an independent risk variable of the banks.

3.2.3. Institutional Indicators

The process by which governments are selected, controlled and replaced, the Government's ability to formulate and implement sound policies effectively and respect for citizens and the State for the institutions that govern Social and economic interactions are included in the institutions. We believe that banks are more likely to grow in environments where governance indicators are based on solid foundations and could have an impact on bank risk. We use two indicators compiled by Kaufmann et al (2010) as proxies of institutions. The index of rule of law (RL) captures the quality of contract enforcement and the index of regulatory quality (RQ), measures the ability of the government to formulate and apply sound policies for regulation. These governance indicators capture cross-country differences in institutional developments and might have an effect on banking risk (Cihak & Hesse, 2010).

3.2.4. Stability Indicators

- **Financial crisis (FC) :** We aim to test the impact of financial crisis on Islamic banks. Many researchers examined the financial stability of Islamic banks during the subprime crisis. Islamic banks are often supposed to be more resilient to a financial crisis than their conventional counterparts (Boumediene & Caby, 2009; Cihak & Hesse, 2010; Al Ali & Yousfi, 2012, Gheninmi et al., 2016). Other researchers found that there was no difference between Islamic and conventional banks difference in the financial stability during the global financial crisis (Hasan &

Dridi, 2010; Gamagita & Rokhin, 2011). To verify this, a dummy variable for the FC period is defined, which takes a value of one for the FC period (2007 to 2009)³, and zero otherwise.

- **Arab spring (AS)** : We incorporate the effect of the recent political instability in the Mena region. In fact, several countries among the sample countries have faced political turmoil that has adversely affected the stability of their banking systems. The World Bank (2013) reported an important decline in the Z-score for the majority of the affected countries. According to Ghosh (2015), “*the impact of the Arab Spring was asymmetric, with limited or virtually no impact on certain countries and moderate to severe impact in several others in Mena region*”. Ghenimi et al. (2016) find that Islamic banks are more stable than conventional banks during the financial crisis and the Arab Spring. To investigate the effect of the Arab spring, we created country-specific crisis dummy variables that take values of one if the country faced severe political instability, otherwise zero. We predict that political turmoil would raise bank risk.

4. Empirical Study

4.1. Data and Model Specifications

To analyze empirically the determinants of Islamic bank risk, we used a sample of 34 Islamic banks in 13 countries during the period of 2000 à 2013. Countries origins of bank data are displayed in the Table 2.

Table 2: Countries included in the sample

	List of countries	Number of Banks
1	UAE	5
2	Egypt	3
3	Saudi Arabia	4
4	Bahrein	4
5	Sudan	1
6	Palestine	2
7	Iran	1
8	Syria	1
9	Yemen	2
10	Qatar	3
11	Iraq	2
12	Jordan	2
13	Kuwait	4

- **Econometric model specification**

In this study, we use the dynamic panel data to identify the key factors affecting credit risk and insolvency risk in Islamic banks in MENA region.

The general form of the model is as follows:

$$y_{it} = a_i + \beta y_{it-1} + \alpha X_{it} + \varepsilon_{it} \quad (1)$$

More precisely, according to the above cited literature, consider the following dynamic model:

$$Risk_{i,t} = \beta_0 + \beta_1 Risk_{i,t-1} + \beta_2 Bank\ Spec_{i,t} + \beta_3 Country\ spec_{j,t} + A'W_{j,t} + u_j + \vartheta_t + \varepsilon_{it} \quad (2)$$

$Risk_{it}$ is insolvency risk or credit risk between $t - 1$ and t . $bankSpec$ are the indicators of overall banking financing, W_{it} is the set of explanatory variables described above: institutional indicators (rule of law; regulatory quality) and stability indicators (financial crisis and Arab spring).

The country-specific factor u_i is a random effect possibly correlated with the explanatory variables; it varies across countries but not over time. ϑ_t the time-specific effect. The regression error term ε_{it} may be correlated with at least a subset of the explanatory variables. It varies both across

³ We follow Kabir et al. (2015), Dimitrou et al. (2013) and Saffiullah and Shamsuddin (2018) and define the years 2007, 2008 and 2009, respectively, as the initial financial turmoil, sharp financial market deterioration and macroeconomic deterioration phases of the global financial crisis.

countries and over time. The subscripts i and t denote individual (country) and temporal (time-period) dimensions respectively.

Our econometric model can be expressed as follows :

$$CR_{it} = \alpha + \beta_1 Size_{it} + \beta_2 LQ_{it} + \beta_3 CA_{it} + \beta_4 AQ_{it} + \beta_5 ME_{it} + \beta_6 SPEC_{it} + \beta_7 DIV_{it} + \beta_8 GDP_{jt} + \beta_9 INF_{jt} + \beta_{10} RQ_{jt} + \beta_{11} FC + \beta_{12} AS + \xi_{ijt} \quad (3)$$

$$CR_{it} = \alpha + \beta_1 Size_{it} + \beta_2 LQ_{it} + \beta_3 CA_{it} + \beta_4 AQ_{it} + \beta_5 ME_{it} + \beta_6 SPEC_{it} + \beta_7 DIV_{it} + \beta_8 GDP_{jt} + \beta_9 INF_{it} + \beta_{10} RL_{jt} + \beta_{11} FC + \beta_{12} AS + \xi_{ijt} \quad (4)$$

$$Z-score_{it} = \alpha + \beta_1 Size_{it} + \beta_2 LQ_{it} + \beta_3 CA_{it} + \beta_4 AQ_{it} + \beta_5 ME_{it} + \beta_6 SPEC_{it} + \beta_7 DIV_{it} + \beta_8 GDP_{jt} + \beta_9 INF_{jt} + \beta_{10} RQ_{jt} + \beta_{11} FC + \beta_{12} AS + \xi_{ijt} \quad (5)$$

$$Z-score_{it} = \alpha + \beta_1 Size_{it} + \beta_2 LQ_{it} + \beta_3 CA_{it} + \beta_4 AQ_{it} + \beta_5 ME_{it} + \beta_6 SPEC_{it} + \beta_7 DIV_{it} + \beta_8 GDP_{jt} + \beta_9 INF_{jt} + \beta_{10} RL_{jt} + \beta_{11} FC + \beta_{12} AS + \xi_{ijt} \quad (6)$$

We estimate the equations (3), (4), (5) and (6) using GMM process. This method takes into account individual and temporal disparities. This method has several advantages over the method of transversal instrumental variables, in particular in the control of endogeneity and measurement of errors in the financial development indicator, but also in the explanatory variables. This method has been used by many authors who compare the determinants of credit risk and the relationship between credit risk and financial stability of conventional banks and Islamic banks in several contexts. But very few studies have used this estimation method to study this relationship by only holding the Islamic banks (Haryono et al., 2016; Trad et al., 2017; Safiullah & Shamsuddi, 2018). Our goal is to test this relationship by focusing on the MENA ' region.

β : is the model coefficient to estimate.

ξ_{ijt} : represents the error term.

i, j and t indicate respectively : banks (1-34), countries (1-13) and time period (2000-2013).

The variables are explained in Table 3.

Table 3: Variable definitions and data sources

	Variables	Acronyms	Description	Source
Dependent Variables	Insolvency Risk	Z-Score	(Return on assets + Capital ratio) / Returns on assets standard deviation	Bankscope database
	Credit Risk	CR	Loans / Deposits	Bankscope database
Bank-Specific Indicators	SIZE	SIZE	Natural Logarithm of total assets	Bankscope database
	Liquidity	LQ	Short-term asset / total deposits	Bankscope database
	Capital Adequacy	CA	Total equity / Total assets	Bankscope database
	Asset Quality	AQ	Loan loss provisions / total loans	Bankscope database
	Management Efficiency	ME	Ratio of operating costs/income	Bankscope database
	Specialization	SPEC	Deposits / Total assets	Bankscope database
	Diversification	DIV	Net fees income / Total assets	Bankscope database
Countries-Specific Indicators	GDP Growth Rate (%)	GGDP	General government final consumption expenditure (% GDP).	World Bank
	Inflation Rate (%)	INF	Inflation rate: measured by the growth of the consumer price index (annual %).	World Bank
Institutional Indicators	Regulatory Quality	RQ	The estimate index of regulatory quality gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	World Bank World Governance Indicators (WGI)
	Rule of Law	RL	The estimate Rule of Law index gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	World Bank World Governance Indicators (WGI)
Stability Indicators	Financial Crisis	FC	Dummy variable that takes 1 during years 2007-2009 and 0 otherwise.	
	Arab Spring	AS	Dummy variable that takes 1 during the period 2012-2013 and 0 otherwise.	

4.2. Descriptive Statistics

Table 4 presents the summary of the descriptive statistics of both dependent and independent variables. The table shows the mean, standard deviations, minimum and maximum in order to provide an insight into the distribution of the underlying variables. Concerning the dependent variables, the mean value of Z-score is about 21.45 with a standard deviation of 24.11. While the mean value of credit risk is about 0.94 with a standard deviation of 0.94. The descriptive statistics for the bank specific variables show a mean variable for size about 15.87. We find also that liquidity risk (LQ) has an average value of 1.23 and a standard deviation of 1.55. For the capital adequacy ratio (CA), we report an average value of 0.17. As measured by capital to total assets, we can explain this weak value by an important value of total assets and not automatically by a weak amount of capital. Table 4 reveals also for macroeconomic variables average values for GDP per capita growth (GGDP) and inflation (INF) which are about 0.19 % and 5% respectively. The standard deviations of both variables are about 0.05.

Table 4: Descriptive Statistics

Variable	Observations	Mean	Std. deviation	Min	Max
Z-score	250	21.4524	24.1188	-2.5702	236.09
CR	250	0.9427	0.9513	0.0479	11.5544
SIZE	250	15.8767	2.5572	11.1719	27.0608
LQ	250	1.2303	1.5558	0.1978	18.6668
AQ	250	0.5267	0.2089	0.0154	0.9311
CA	250	0.1795	0.1345	0.0296	0.9431
ME	250	0.3464	1.8642	-28.5205	1.9298
SPEC	250	0.6803	0.1884	0.0515	0.9410
DIV	250	0.0066	0.0103	-0.0040	0.0951
GDP	250	0.0019	0.0546	0.1514	0.1749
INF	250	0.0516	0.0509	-0.0486	0.3670
RQ	250	0.1617	0.6159	-1.7303	1.1161
RL	250	0.2300	0.5479	-1.6154	1.0536

The estimation of the multiple regression models requires the absence of multicollinearity between the different independent variables. The correlation matrix is presented in Table 5. We note from the table that the variables rule of law (RL) and regulatory quality (RQ) present a high level of correlation (0.86). Hence, they will be introduced separately in the different regressions. For the rest of the variables, all correlation coefficients are below 0.8, which implies the rejection of the existence of multicollinearity problem.

Table 5: Correlation matrix

	SIZE	LQ	AQ	CA	ME	SPEC	DIV	GDP	INF	RQ	RL	FC	AS
SIZE	1												
LR	-0.2528**	1											
AQ	0.2524***	-0.0656	1										
CA	-0.2674***	0.0101***	-0.2012**	1									
ME	0.0147	0.0061	0.0301	0.0209	1								
SPEC	0.1190*	0.1369***	0.1873**	-0.7132***	-0.0448	1							
DIV	0.0049	-0.0884	-0.0734	0.1959**	0.0027	-0.1610*	1						
GDP	0.0806	0.1264	-0.1058*	0.0041	0.0232	0.0922	0.0649	1					
INF	0.2979***	-0.0494	-0.1016	-0.1177*	0.0503	0.0305	0.0095	0.0109	1				
RQ	-0.3017***	-0.0636	0.1400**	0.0919	-0.0817	-0.0489	-0.0596	-0.2285	-0.4692	1			
RL	-0.1869***	0.0277	0.2877***	0.0186	-0.0643	-0.0310	-0.1236*	-0.2315	-0.4091***	0.8682	1		
FC	0.0104	-0.0316	-0.0638	0.0229	0.0213	-0.0428	0.0123	-0.2795***	0.3089***	-0.1094*	-0.0574	1	
AS	0.1044*	-0.0594	0.0902	-0.0586	0.0555	-0.0084	-0.0039	0.225***	-0.125*	-0.0091	-0.0889	-0.4241***	1

*Significant at 10%; ** significant at 5%; *** significant at 1%.

5. Results and Analysis

The table 6 presents the results of the regressions (3, 4, 5, 6) of the determinants of the risk of Islamic banks when Credit risk and Insolvency risk (Z-score) are the dependant variables and the GMM is the method used to estimate our model. The table show that the serial correlation and the Sargan tests do not reject the null hypothesis of correct specification. In fact, P-value of AR (2) test and P value of Sargan test of Arellano and Bond are both larger than 5% lending support to our estimation results.

Table 6: Empirical Results

Independent variables	Dependent variables			
	Z-Score	Z-Score	CR	CR
	(1)	(2)	(1)	(2)
Lag of dependent variable	0.5348 (32.91)***	0.5254 (34.37)***	-0.0177 (-4.69)***	-0.0154 (-4.40)***
SIZE	3.6408 (4.93)***	3.5352 (4.65)***	0.0625 (6.95)***	0.054 (0.53)
LQ	-2.2458 (-1.74)*	-0.6652 (-0.94)	0.583 (24.93)***	0.5775 (19.22)***
AQ	7.7575 (6.55)***	7.3013 (6.83)***	1.9017 (21.21)***	1.9446 (18.41)***
CA	76.9679 (11.98)***	74.9935 (9.42)***	-1.4622 (-5.36)***	-1.4807 (-5.11)***
ME	-0.0056 (-0.29)	-0.0133 (-0.94)	0.0007 (1.09)	0.0015 (0.44)
SPEC	7.4983 (6.09)***	2.5497 (1.19)	-2.400 (-13.86)***	-2.4496 (-12.92)***
DIV	185.0961 (1.89)*	175.8617 (1.90)*	-6.8765 (-2.89)***	-4.9431 (-1.75)*
GDP	3.4134 (0.45)	-0.5274 (-0.11)	0.4110 (2.86)***	0.3911 (2.99)***
INF	-25.6778 (-2.96)***	-21.1179 (-2.13)**	0.1667 (1.45)	-0.03952 (-0.27)
RQ	1.7692 (2.27)**	- -	-0.1664 (-3.06)***	- -
RL	- -	2.7597 (2.62)***	- -	-0.3045 (-3.61)***
FC	-0.2099 (-0.59)	-0.3264 (-0.96)	0.0935 (1.60)	0.0892 (1.41)
AS	1.4958 (3.15)***	1.6461 (3.84)***	0.0166 (1.41)	0.0006 (0.06)
Constant	-67.3139 (-6.38)***	-62.2494 (-4.91)***	0.2268 (0.87)	0.4374 (1.36)
Observations	216	216	216	216
Sargan test	23.1470	22.3851	13.6270	12.5427
P-value of Sargan test	0.4522	0.4971	0.9371	0.9612
Arellano & Bond test AR(1)	-1.7659	-1.7934	-1.1339	-1.1362
P-value of AR(1)	0.0774	0.0729	0.2568	0.2559
Arellano & Bond test AR(2)	-0.4088	-0.4321	-1.2851	-1.4276
P-value of AR(2)	0.6827	0.6657	0.1987	0.1534

*Significant at 10%; ** significant at 5%; *** significant at 1%. Values in brackets are the robust t statistic

Analysis

• Bank specific indicators

Table 6 shows that 6 bank specific variables out of fourteen variables are significantly related to credit risk for Islamic banks. They are Size, LQ, AQ, CA, SPEC and DIV.

Capital adequacy coefficients are positive and statistically significant when we consider Z-Score as dependant variable (regressions 3 and 4). However, they are negative and significant when we

consider credit risk as dependent variable (regressions 5 and 6). This indicates that Islamic banks risk taking behavior is influenced by capital adequacy as the higher the capital the lower is the credit risk and the insolvency risk, although the coefficient sign is consistent with Sufian and Muhamed (2011). This result is in line with Misman et al. (2015), Trad et al. (2017) and Bitar et al. (2017). In fact, a higher level of regulatory capital owned by Islamic banks will help them to reduce their exposure to credit risk and insolvency risks. This implies that the increase in equity and a prudent capital management policy allow the Islamic banks to improve through diligence and discipline in the management of risk exposures.

The coefficients of the variable measuring the liquidity variable are positive and significant in the z-score specification. Nevertheless, they report mixed results regarding the relationship between liquidity and credit risk. Our results show that the higher the liquidity the lower is insolvency risk exposure. The finding is consistent with Rajhi and Hassairi (2013) and Bitar et al. (2017) who find that liquidity is an indicator of Islamic banks' financial soundness. Hence, Islamic banks must look for ways to allow them to have more liquidity. In fact, they generally run more credit risk due to the religious constraints on accessing interest-based funds from the money market or the central bank's lender of the last resort facility. The coefficient sometimes positive or negative in the credit risk specification shows that on the one hand, the lack of liquidity can lead to large losses in asset/liability portfolios and it can generate credit risk. On the other hand, excess liquidity undermines efficiency and generates more credit risk. According to Rajhi and Hsairi (2013), Islamic banks are more prone to liquidity risk due to their limited access to an interbank market or hedging instruments.

Specialization is a very significant factor influencing negatively insolvency risk and credit risk of Islamic banks. This result is in line with Abedifar et al. (2013) who explain that Islamic banks may face less credit risk given the positive relationship between religiosity and an individual's risk aversion.

The coefficients for Asset Quality are both positive and statistically significantly related to credit risk in Islamic banks. The signs are as expected but it indicates that a higher LLP indicates an increase in risk and a deterioration in loan quality. Our results corroborate those of Fisher et al. (2000) where (LLP to total loans) is positively related to risk, and Safiullah and Shamsuddi (2018) who showed that the higher the ratio of LLP, the greater the credit risk. Nevertheless, a good asset quality reduces insolvency risk. Beck et al. (2013) find the same result and show that Islamic banks have better asset quality and an ability to take risks.

Table 6 shows also that bank size affects negatively the insolvency risk since the coefficients relating to this variable are always positive and significant in the Z-Score model as an inverse measure of risk. Indeed, banks with higher assets benefit from scale and scope economies and larger banks may benefit from their market powers. Our results are in line with Trad et al. (2017) and Rajhi and Hassairi (2013), who found that bank size has contributed to banking stability. Nevertheless, our results show that bank size has a positive and significant effect on credit risk. It may be because banks with larger transactions may incur higher risk in which higher margins are needed (Maudos & Solís, 2009).

Regarding the relationship between management efficiency and the insolvency risk and credit risk, we found no significant relationship between these two variables in all estimated regressions.

Macroeconomic Indicators

GDP growth (GGDP) is not significant when we use Z-score as dependent variable. This finding is in line with Cihak and Hesse (2010). Hence, the result does not allow us to identify business cyclical behavior of Z-score in MENA countries as suggested by Rajhi and Hsairi (2013). However, we identify a positive and a very significant coefficient of GGDP when we use credit risk (CR) as dependent variable. This finding is consistent with Srairi (2013) and Trad et al. (2016).

Inflation rate affects negatively and significantly the insolvency risk (Z-score). This result can be explained by the fact that price stability contribute in to the stability of the banking sector (Rajhi & Hsairi, 2013). However, it is negative and non-significantly related to credit risk. This result is consistent with Waemustafa and Sukri (2015) and Trad et al. (2016). Castro (2013) argue that high

inflation can facilitate debt servicing by reducing the real value of the outstanding loans. Nevertheless, it can also weaken the ability of borrowers to repay their debt by reducing real income. In addition, Shu (2002) believes that accelerating credit expansion will reduce the default rate. In fact, inflation allows borrowers to repay their loan from the availability of funds. Besides, Demirguc-Kunt and Huizinga (2010) explain that high cost income is associated with high inflation that affects the decision of bank to allocate their assets into interest and fee. This should generate activities as well as profitability by taking in consideration the macroeconomic influences.

Institutional Indicators

Table 6 shows also positive and significant coefficients for both institutional indicators (RL and RQ) when we consider Z-score as dependent variable. However, these coefficients are negative and significant when we use credit risk (CR) as dependent variable. This is in line with Srairi (2013) and Cihak and Hesse (2010) who explain that better governance is generally correlated with higher z-scores and lower credit risk.

Stability Indicators

Table 6 indicates that the financial crisis (FC) does not affect Islamic bank risk. In fact, the coefficient of FC is non-significant for all the regression. This result is in line with Safiullah and Shamsuddin (2018). This finding can be explained by the fact that Islamic banks are more resilient to a financial crisis than their conventional counterparts.

We also note that the coefficient of the Arab Spring indicator (AS) is positively and significantly related to insolvency risk (Z-score). However, this coefficient is insignificant when we use credit risk as dependent variable. This finding is in line with Ghenimi et al. (2016) who find that Islamic banks are more stable than conventional banks during the financial crisis and the Arab Spring. This finding indicates that Islamic banks faced less risk caused by political conflicts during the Arab spring.

Conclusion

Since its creation, Islamic finance has experienced exceptional growth. The International Monetary Fund (IMF), the World Bank and other international financial organizations believe that the assets of Islamic banks have increased nine times between 2003 and 2013, an increase of 16% per year. According to Standard and Poor's, they currently exceed 2 trillion in 2015. More than 40 million people worldwide are currently customers of an Islamic bank. This sector will still double in size to in 2020, according to Standard and Poor's. These Islamic Financial institutions manage total assets worth more than US \$1.5 trillion (Kammer et al., 2015).

Credit risk is a major factor of the performance of the banking system and it becomes more popular in financial analysis (Uda, Hamid, & Janor, 2018). Meanwhile, Islamic banking seems to manage solvency and credit risk better than conventional banks (Hanif et. al., 2012). This risk management depends directly on both internal and external environment in banks.

The purpose of our study is to study the effect of bank specific and macroeconomic determinants on credit and insolvency risks of Islamic banks. We also investigate the effect of both global financial crisis and the political turmoil during Arab spring. Using a dataset of 34 Islamic banks belonging to 13 countries from the Mena region during the period 2000-2013 and performing the GMM method, our findings reveal that that bank size, capital adequacy, liquidity, diversification and specialization ratios are the major factors affecting the stability of Islamic banks. For macroeconomic factors, GDP is significant to credit risk and inflation is significant to insolvency risk. Finally, we find that financial crisis does not affect Islamic bank risk while Arab spring has significant influence on credit risk.

In general, the findings are important for the identification of the factors influencing Islamic bank risk then, for providing information that the bank management and regulators should pay attention to, in order to improve risk management in Islamic banking.

References

- [1] Abedifar, P., Hasan, I. & Tarazai, A. (2016). Finance-growth nexus and dual-banking systems: Relative importance of Islamic banks. *Journal of economic Behavior and Organization*, 132, pp.198-215.
- [2] Abedifar, P., Molyneux, P., & Tarazi, A., (2013). Risk in Islamic banking. *Review of Finance*. 17(6), pp. 2035–2096.
- [3] Ahmad, N.H., & Ahmad, S.N. (2004). Key factors influencing credit risk of Islamic bank: A Malaysian case. *The Journal of Muamalat and Islamic Finance Research*, 1(1), pp. 65-80.
- [4] Baele, L., Farooq, M., & Ongena, S. (2012). Of Religion and Redemption: Evidence from Default on Islamic Loans. (Replaces Center DP 2010-136). (Center Discussion Paper; Vol. 2012-014). Tilburg: Finance
- [5] Beck, T., Demirgüç-Kunt, A., & Merrouche, O., (2013). Islamic vs. Conventional Banking Business Model, Efficiency and Stability. *Journal of Banking & Finance*, 37, pp. 433 – 447.
- [6] Ben Khediri, K., Charfeddine, L. & Ben Youssef, S. (2015). Islamic versus conventional banks in the GCC countries: A comparative study using classification techniques. *Research in International Business and Finance*, 33, pp. 75–98.
- [7] Berger, A. N. & De Young, R. (1997). Problem Loans and Cost Efficiency in Commercial Banks. *Journal of Banking and Finance*, 21, pp. 849-870.
- [8] Berger, A. N., & Udell, G. F. (1990). Collateral, Loan Quality, and Bank Risk. *Journal of Monetary Economics*, 25, (January): 21-42.
- [9] Bitar, M., Hassan, M.K., & Walker, T. (2017). Political systems and the financial soundness of Islamic banks. *Journal of Financial Stability*, 31, pp. 18–44.
- [10] Boukhris, K. and Nabi, S.N., (2013). Islamic and conventional banks' soundness during the 2007– 2008 financial crisis. *Review of Financial Economics*, 22 (2), pp. 68–77.
- [11] Chapra, M. Umer, & Khan, T. (2000). Regulation and Supervision of Islamic Banks. IRTI Occasional Paper No3, Islamic Development Bank.
- [12] Čihák, M., & Hesse, H., (2010). Islamic banks and financial stability: an empirical analysis. *Journal of Financial Services Research*, 38(2-3), pp. 95–113.
- [13] Dridi, J., & Hasan, M., (2010). Have Islamic Banks Been Impacted Differently than Conventional Banks During the Recent Global Crisis? IMF Working Paper. International Monetary Fund, Washington.
- [14] Febianto, I., (2012). Adapting Risk Management for Profit and Loss Sharing Financing of Islamic Banks. *Modern Economy*, 3, pp. 73-80.
- [15] Ftiti, Z., Nafti, O. & Srairi, S. (2013). Efficiency of Islamic Banks during Subprime Crisis: Evidence of GCC Countries. *The Journal of Applied Business Research*, January/February, 29 (1), pp. 285-304.
- [16] Ghosh, S., (2016). Political transition and bank performance: How important was the Arab Spring? *Journal of Comparative Economics*, 44 (2), pp. 372-382.
- [17] Hamid, M. A., & Janor, H. binti. (2018). Determinants of Credit Risk in Islamic and Conventional Bank: Evidence from Malaysia. *International Journal of Academic Research in Business and Social Sciences*, 8(6), pp. 1054–1068.
- [18] Hanif, M., Tariq, M., Tahir, A., & Momeneen, W. U. (2012). Comparative performance study of conventional and islamic banking in Pakistan. *International Research Journal of Finance & Economics*, 83.
- [9] Haron, A. & Hock, J.L.H (2007). Inherent Risk: Credit and Market Risks in Islamic Finance: The Regulatory Challenge, by S. Archer and A.A.K. Rifaat, Eds. John Wiley and Son: Asia.
- [20] Haryono, Y., Mohd. Ariffin, N., & Hamat, M. (2016). Factors affecting credit risk in Indonesian Islamic banks. *Journal of Islamic Finance*, 5(1), pp. 12-25.
- [21] How, J. C, Abdul Karim, M., & Verhoeven, P. (2004). Islamic Financing and Bank Risk. *Thunderbird International Business Review*, 47 (1), pp. 75-94.

- [22] Hussain, H.A., & Al-Ajmi, J. (2012). Risk management practices of conventional and Islamic banks in Bahrain. *The Journal of Risk Finance*, 13, pp. 215-239.
- [23] Kabir, M., Worthington, A., & Gupta, R. (2015). Comparative credit risk in Islamic and conventional bank. *Pacific-Basin Finance Journal*, 34(C), pp. 327-353.
- [24] Khan, T., & Ahmed, H. (2001). Risk Management: An Analysis of Issues in Islamic Financial Industry. IRTI Occasional Paper, No5, Islamic Development Bank.
- [25] Laeven, L., Levine, R., (2007). Is There a Diversification Discount in Financial Conglomerates?. *Journal of Financial Economics*, 85, pp. 331-67
- [26] Mat Rahim, S.R. & Zakaria, R.H. (2013). Comparison on stability between Islamic and conventional banks in Malaysia. *Journal of Islamic Economics Banking and Finance*, 9, pp. 131-149.
- [27] Metwally, M.M. (1997). Economic Consequences of Applying Islamic Principles in Muslim Societies. *International Journal of Social Economics*, 24(7/8/9), pp. 941-957.
- [28] Miah M.D., & Uddin, H. (2017). Efficiency and stability: A comparative study between Islamic and conventional banks in GCC countries. *Future Business Journal*, 3 (2), 172-185.
- [29] Misman, F.N., Bhatti. I., Lou, W, Samsuddin S, & Abd Rahman.N.H (2015). Islamic Banks Credit Risk: A Panel Study. *Procedia Economics and Finance*, 31, pp. 75-82.
- [30] Maudos, J., & Solís, L., (2009). The determinants of net interest income in the Mexican banking system: an integrated model. *Journal of Banking and Finance*, 33, pp. 1920-1931.
- [31] Metwally, M. (1997). Differences between the financial characteristics of interest-free banks and conventional banks. *European Business Review*, pp. 92–98.
- [32] Odeduntan, A. K., Adewale, A. A., & Hamisu, S. (2016). Financial Stability of Islamic Banks: Empirical Evidence. *Journal of Islamic Banking and Finance*, 4(1), pp. 39-46
- [33] Olson, D. & Zoubi, T.A., (2008). Using Accounting Ratios to distinguish between Islamic and Conventional Banks in the GCC Region. *The International Journal of Accounting*, 43, pp. 45-65
- [34] Olson, D. & Zoubi, T.A. (2016). Convergence in bank performance for commercial and Islamic banks during and after the Global Financial Crisis. *The Quarterly Review of Economics and Finance*, July.
- [35] Rajhi, W. & Hassairi, S. A. (2013). Islamic banks and financial stability: A comparative empirical analysis between Mena and Southeast Asian countries. *Région et Développement*, 37, pp. 149–177.
- [36] Safiullah, M.D. & Shamsuddin, A. (2018). Risk in Islamic banking and corporate governance. *Pacific-Basin Finance Journal*, 47, pp. 129–149.
- [37] Schaeck, K. & Čihák, M., (2010). Banking Competition and Capital Ratios. *European Financial Management*, 18(5), pp. 836-866.
- [39] Sensoy, A., (2016). Systematic Risk in Conventional and Islamic Equity Markets. *International Review of Finance*, 16 (3), pp. 457-466.
- [40] Shahid, M. A., & Abbas, Z. (2012). Financial stability of Islamic banking in Pakistan: An empirical study. *Journal of Business Management*, 6(10), pp. 3706-3714.
- [41] Siddiqui, A. (2008). Financial contracts, risk, and performance of Islamic banking. *Managerial Finance*, 34(10), pp. 680-694.
- [42] Srairi S. (2013). Ownership structure and risk-taking behaviour in conventional and Islamic banks: Evidence for MENA countries. *Borsa Istanbul Review*, 13(4), pp. 115-127.
- [43] Sundararajan, V. (2007). Risk Measurement and Disclosure in Islamic Finance and the Implications of Profit Sharing Investment Accounts. 6th International Conference on Islamic Economics and Finance, IRTI Islamic Development Bank, pp. 121-134.
- [44] Trad, N., Rachdi, H., Hkimi, A., & Guesmi, K., (2017). Banking stability in the MENA region during the global financial crisis and the European sovereign debt debacle?. *The journal of Risk Finance*, <https://doi.org/10.1108/JRF-10-2016-0134>.

- [45] Trad, N. Trabelsi, M.A. & Goux, J. F. (2017). Risk and profitability of Islamic banks: A religious deception or an alternative solution?. *European Research on Management and Business Economics*, 23 (1), pp. 40-45.
- [46] Waemustafa, W., & Sukri, S. (2015). Bank Specific and Macroeconomics Dynamic Determinants of Credit Risk in Islamic Banks and Conventional Banks. *International Journal of Economics and Financial Issues*, 5(2), pp. 476-481.

Appendix

Figure 1: Global Islamic Fund Asset Trend



Figure 2: Global Islamic Banking Assets By Region

